

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : **NOK CORP**

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(72)Inventor : **KUROKI YUICHI**

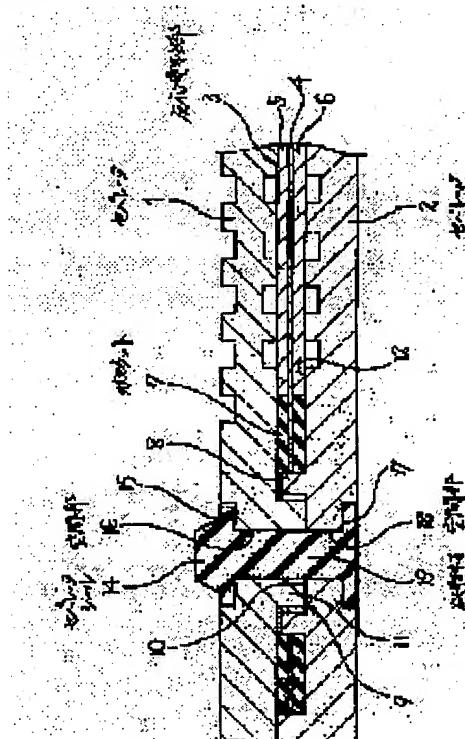
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## (54) FUEL CELL SEPARATOR ASSEMBLY SEAL STRUCTURE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a fuel cell separator assembly seal structure which can raise a dimensional stability of a reaction electrode section 3, while raising an assembling workability of a fuel cell stack.

**SOLUTION:** Space sections 16, 18 are prepared so that they may communicate with two or more separators 1, 2 mutually which sandwich a reaction electrode section 3. These two or more separators 1, 2 are unified in the piled-up state mutually, by injection molding of a molding material 19 which consists of a rubber, a liquid rubber, or a thermoplastic elastomer or the like into the space sections 16, 18.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] The space section (16) and (18) are prepared so that it may be mutually open for free passage to two or more separator (1) which puts the reaction electrode section (3), and (2). Fuel cell separator assembly seal structure which unifies where two or more aforementioned separator (1) and (2) are mutually piled up by carrying out pouring fabrication of the forming material (19) set to the aforementioned space section (16) and (18) from rubber, liquid rubber, or thermoplastic elastomer, and is characterized by the bird clapper.

[Claim 2] Fuel cell separator assembly seal structure where the forming material (19) by which pouring fabrication was carried out the space section (16) of two or more separator (1) and (2) and (18) is characterized by the separator seal (14) prepared at the external surface of at least one separator (1), and really being fabricated in the fuel cell separator assembly seal structure of a claim 1.

[Claim 3] Fuel cell separator assembly seal structure characterized by arranging the gasket (7) put between the periphery of the reaction electrode section (3) between two or more separator (1) and (2) in the fuel cell separator assembly seal structure of claims 1 or 2.

[Claim 4] Fuel cell separator assembly seal structure characterized by applying a liquid rubber hardened material (22) to the periphery section of the electrolyte film (4) in the reaction electrode section (3), and making the aforementioned liquid rubber hardened material (22) paste up to the aforementioned electrolyte film (4) and separator (1), and (2) in the fuel cell separator assembly seal structure of claims 1 or 2.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[The technical field to which invention belongs] this invention relates to the fuel cell separator assembly seal structure which makes the separator for fuel cells a part [ a component ].

**[0002]**

[Description of the Prior Art] Since the separator 53 of a couple is not attached mutually but is conventionally used as another parts, respectively while a gasket 54 is separately arranged, respectively between the electrolyte film 52 in the reaction polar zone 51, and the separator 53 of the couple which puts this as shown in drawing 7, the assembly of a fuel cell stack has taken the great man day. Moreover, since the reaction polar zone 51 does not serve as constant \*\*\*\*\*\*, there is un-arranging [ which it is referred to as that the size is not stabilized ], and a size may change with seal reaction force.

**[0003]**

[Problem(s) to be Solved by the Invention] this invention aims at offering the fuel cell separator assembly seal structure which can raise the dimensional stability of the reaction polar zone while it raises the assembly nature of a fuel cell stack in view of the above point.

**[0004]**

[Means for Solving the Problem] By carrying out the injection molding of the forming material which becomes the aforementioned space section from rubber, liquid rubber, or thermoplastic elastomer, the fuel cell separator assembly seal structure according to the claim 1 of this invention in order to attain the above-mentioned purpose prepares the space section so that it may be mutually open for free passage to two or more separator which puts the reaction polar zone, and it unifies, where two or more aforementioned separator is piled up mutually, and it is characterized by the bird clapper.

[0005] Moreover, fuel cell separator assembly seal structure of the claim 2 of this invention is characterized by the separator seal prepared in the superficies of at least one separator, and really fabricating the forming material by which the injection molding was carried out to the space section of two or more separator in the above-mentioned fuel cell separator assembly seal structure of a claim 1.

[0006] Moreover, fuel cell separator assembly seal structure by the claim 3 of this invention is characterized by arranging the gasket put between the periphery of the reaction polar zone among two or more separator in the above-mentioned fuel cell separator assembly seal structure of claims 1 or 2.

[0007] Furthermore, fuel cell separator assembly seal structure by the claim 4 of this invention is characterized by applying a liquid rubber hardened material to the periphery section of the electrolyte film in the reaction polar zone, and making the aforementioned liquid rubber hardened material paste up to the aforementioned electrolyte film and separator again in the above-mentioned fuel cell separator assembly seal structure of claims 1 or 2.

[0008] In the separator assembly seal structure of this invention equipped with the above-mentioned composition The space section is prepared so that it may be mutually open for free passage to two or more separator which puts the reaction polar zone. Since two or more separator is unified in the state where it piled up mutually, by carrying out the injection molding of the forming material which becomes this space section from rubber, liquid rubber, or thermoplastic elastomer It becomes possible to deal with it to one by using as assembly finishing parts two or more of these separator that put the reaction polar zone (claim 1).

[0009] Moreover, since two or more separator is unified in the state where it piled up mutually, two or more of these separator is made into constant \*\*\*\*\* structure. Therefore, it becomes possible to stabilize the size of the thickness direction of the reaction polar zone (claim 1).

[0010] The forming material by which the injection molding is carried out to the space section of two or more separator becomes it is suitable to really fabricate with the separator seal prepared in the superficies of at least one separator and a material of the same kind, and possible [ simplifying a forming cycle by really fabricating forming material and a separator seal in this way ] (claim 2).

[0011] Moreover, it becomes it is suitable to carry out a seal with the gasket arranged at the periphery of the reaction polar zone, and possible [ reducing the number of installation of a gasket conventionally by carrying out the seal of between separator with the gasket arranged at the periphery side of the reaction polar zone in this way ] between two or more separator unified mutually (claim 3).

[0012] moreover, making a seal execute by proxy with the liquid rubber hardened material applied to the periphery section of the electrolyte film in the reaction polar zone, when anxious about an operation of the reaction force by this gasket -- it becomes it is suitable and possible to lose generating or an operation of reaction force by using a liquid rubber hardened material as a binder seal in this way (claim 4)

[0013]

[Embodiments of the Invention] The example of this invention is explained according to a drawing below.

[0014] The first example ... Drawing 1 shows the important section cross section of the fuel cell separator assembly seal structure concerning the first example of this invention, and the state before the assembly is shown in drawing 2. This separator assembly seal structure constitutes the cell for fuel cells as a package, and is constituted as follows.

[0015] That is, the separator 1 and 2 of the vertical couple piled up mutually first is formed, and the reaction polar zone (it is also called the MEA section) 3 is put between the separator 1 and 2 of this couple. The reaction polar zone 3 lays a positive electrode 5 and a negative electrode 6 on top of the vertical both sides of the electrolyte film 4. The gasket 7 made from rubber-like elasticity material is arranged at the periphery side of the reaction polar zone 3, between the separator 1 and 2 of a couple, predetermined compresses and this gasket 7 is put with \*\*. Drawing, expansion formation of the periphery section of the electrolyte film 4 is carried out in the direction of a flat surface rather than the periphery section of a positive electrode 5 and a negative electrode 6, the gasket 7 made from rubber-like elasticity material is arranged at the vertical both sides of the periphery section of this electrolyte film 4 by which expansion formation was carried out, and required-number formation of the bore 8 for keeping putting the positioning section 9 which carries out a postscript to the laminated structure which consists of this electrolyte film 4 and gasket 7 is carried out. The up-and-down gasket 7 may really be mutually fabricated through a bore 8.

[0016] The separator 1 and 2 of a couple is inserted in mutually and made into structure, and when required-number \*\*\*\*\*\*, this crevice 10, and heights 11 are mutually engaged by the positioning section 9 which becomes both this separator 1 and 2 from the combination of a crevice 10 and heights 11, both the separator 1 and 2 is positioned mutually. Along with the periphery section of separator 1 and 2, as for the positioning section 9, a large number are prepared in the single tier. Moreover, the crevice 12 for holding the reaction polar zone 3 and gasket 7 other than a crevice 10 is established in the inside of the lower separator 2.

[0017] It is located above the positioning section 9, the separator seal 14 is formed in the external surface of the upper separator 1, and this separator seal 14 is formed in endless along with the periphery section of separator 1. Moreover, this separator seal 14 is formed along the slot 15 similarly established in endless along with the periphery section of separator 1, and required-number opening formation of the through-hole-like space section (it is also called a through hole) 16 is carried out on the base of this slot 15. Corresponding to each positioning section 9, as for the space section 16, one is prepared at a time in the center of a flat surface. Moreover, corresponding to the slot 15 established in the external surface of the separator 1 of this top, the slot 17 is formed also like the external surface of the lower separator 2, and required-number opening formation of the through-hole-like space section (it is also called a through hole) 18 is carried out also on the base of this slot 17. As for the space section 18, corresponding to each positioning section 9, one is prepared at a time in the center of a flat surface also for this.

[0018] Correspondence formation of the upper space section 16 and the lower space section 18 is carried out mutually, it is mutually open for free passage, and pouring fabrication of the forming material 19 is carried out in both these space sections 16 and 18 and both the slots 15 and 17. The forming material 19 is its upper separator seal 14 and really fabricated, and simultaneous fabrication of this forming material 19 and the separator seal 14 is carried out by compression molding or injection molding by making rubber-like elasticity material, such as rubber, liquid rubber,

or thermoplastic elastomer, into a molding material. Moreover, by carrying out pouring fabrication of this forming material 19 at the space sections 16 and 18, the separator 1 and 2 of a couple is the form where the base of the above-mentioned crevice 10 and the apical surface of heights 11 are made to associate in the thickness direction of separator 1 and 2, and is unified in the state where it piled up.

[0019] In the separator assembly seal structure equipped with the above-mentioned composition The space sections 16 and 18 are formed with slots 15 and 17 so that it may be mutually open for free passage to the separator 1 and 2 of the couple which puts the reaction electrode section 3. Since the separator 1 and 2 of a couple is unified in the state where it piled up mutually, by carrying out pouring fabrication of the forming material 19 which becomes these space sections 16 and 18 and slots 15 and 17 from rubber, liquid rubber, or thermoplastic elastomer It can be dealt with to one by making into a cell assembly (cell Assy) the separator 1 and 2 of this couple that put the reaction electrode section 3. Therefore, the assembly nature of a fuel cell stack can be raised. In addition, since slots 15 and 17 escape from separator 1 and 2, stop the space section 16 and the forming material 19 in 18, and carry out them by the forming material 19 with which it fills up here and they are [ if the opening cross section of the through-hole-like space sections 16 and 18 is set up at the penetration direction edge more greatly than a center section, stop escaping ] effective, they are unnecessary in this case. [ of slots 15 and 17 ] Therefore, slots 15 and 17 may not have the need of preparing this.

[0020] Moreover, in the assembly seal structure of the above-mentioned composition, since the separator 1 and 2 of a couple is unified in the state where it piled up mutually, the separator 1 and 2 of this couple is made into constant \*\*\*\*\* structure. Therefore, the size of the thickness direction of the reaction electrode section 3 can be stabilized.

[0021] Moreover, since the forming material 19 by which pouring fabrication is carried out is really fabricated by the space sections 16 and 18 and the slots 15 and 17 of separator 1 and 2 with the separator seal 14 and a material of the same kind, fabrication can be finished at once. Therefore, a forming cycle can be simplified.

[0022] Furthermore, since the seal of between the separator 1 and 2 of the couple unified mutually again is carried out by the gasket 7 arranged at the periphery side of the reaction polar zone 3, the gasket 7 combined with both the separator 1 and 2 can be shared. Therefore, the number of installation of a gasket 7 is reducible conventionally (although the gasket 7 is made into vertical dual structure in the above-mentioned example in order to heighten the seal force, single structure is sufficient and, in the case of this single structure, the only gasket is shared by both the separator 1 and 2.). Therefore, the number of installation of a gasket can be reduced as compared with separator 1 and the conventional technology which needed the gasket for every two.

[0023] In addition, it is necessary to set up the conclusion force by the forming material 19 greatly rather than the reaction force of the gasket 7 put in between, and in the assembly seal structure of the above-mentioned composition, in order to maintain unification of separator 1 and 2, as shown in drawing 3, unless it sets the pitch p of the space sections 16 and 18 for conclusion below to 10mm interval and the rubber degree of hardness of forming material is raised, generally, it becomes conclusion lack of ability. Therefore, in such a case, as shown in drawing 4, in order to reinforce the conclusion force, the design disposal of adding an eyelet 20 is needed.

[0024] Moreover, the following examples are suitable, in order to lose generating or its operation of the reaction force of a gasket or to reduce the size.

[0025] The second example ... Drawing 5 shows the important section cross section of the fuel cell separator assembly seal structure concerning the second example of this invention, and the state before the assembly is shown in drawing 6. This separator assembly seal structure constitutes the cell for fuel cells as a package, and is constituted as follows.

[0026] That is, the separator 1 and 2 of the vertical couple piled up mutually first is formed, and the reaction electrode section (it is also called the MEA section) 3 is put between the separator 1 and 2 of this couple. The reaction electrode section 3 lays a positive electrode 5 and a negative electrode 6 on top of the vertical both sides of the electrolyte film 4. The binder seal 21 which is from the liquid rubber hardened material 22 on the periphery side of the reaction electrode section 3 is arranged, and this binder seal 21 is made to paste up to the electrolyte film 4 and separator 1 and 2. Drawing, expansion formation of the periphery section of the electrolyte film 4 is carried out in the direction of a flat surface rather than the periphery section of a positive electrode 5 and a negative electrode 6, and the binder seal 21 which becomes the vertical both sides of the periphery section of this electrolyte film 4 by which expansion formation was carried out from the liquid rubber hardened material 22 is arranged. Required-number formation of the bore 8 for keeping putting the positioning section 9 which carries out a postscript in the

electrolyte film 4 is carried out. About the binder seal 21, it mentions later.

[0027] The separator 1 and 2 of a couple is inserted in mutually and made into structure, and when required-number \*\*\*\*\* this crevice 10, and heights 11 are mutually engaged by the positioning section 9 which becomes both this separator 1 and 2 from the combination of a crevice 10 and heights 11, both the separator 1 and 2 is positioned mutually. Along with the periphery section of separator 1 and 2, as for the positioning section 9, a large number are prepared in the single tier. Moreover, the crevice 12 for holding the reaction electrode section 2 and both the binder seal 21 other than a crevice 10 is established in the inside of the lower separator 2.

[0028] It is located above the positioning section 9, the separator seal 14 is formed in the external surface of the upper separator 1, and this separator seal 14 is formed in endless along with the periphery section of separator 1. Moreover, this separator seal 14 is formed along the slot 15 similarly established in endless along with the periphery section of separator 1, and required-number opening formation of the through-hole-like space section (it is also called a through hole) 16 is carried out on the base of this slot 15. Corresponding to each positioning section 9, as for the space section 16, one is prepared at a time in the center of a flat surface. Moreover, corresponding to the slot 15 established in the external surface of the separator 1 of this top, the slot 17 is formed also like the external surface of the lower separator 2, and required-number opening formation of the through-hole-like space section (it is also called a through hole) 18 is carried out also on the base of this slot 17. As for the space section 18, corresponding to each positioning section 9, one is prepared at a time in the center of a flat surface also for this.

[0029] Correspondence formation of the upper space section 16 and the lower space section 18 is carried out mutually, it is mutually open for free passage, and pouring fabrication of the forming material 19 is carried out in both these space sections 16 and 18 and both the slots 15 and 17. The forming material 19 is its upper separator seal 14 and really fabricated, and simultaneous fabrication of this forming material 19 and the separator seal 14 is carried out by compression molding or injection molding by making rubber-like elasticity material, such as rubber, liquid rubber, or thermoplastic elastomer, into a molding material. Moreover, by carrying out pouring fabrication of this forming material 19 at the space sections 16 and 18, the separator 1 and 2 of a couple is the form where the base of the above-mentioned crevice 10 and the apical surface of heights 11 are made to associate in the thickness direction of separator 1 and 2, and is unified in the state where it piled up.

[0030] The binder seal 21 is as follows.

[0031] That is, expansion formation of the periphery section of the electrolyte film 4 in the reaction electrode section 3 is carried out a little in the direction of a flat surface rather than the periphery section of the positive electrode 5 of the upper and lower sides, and a negative electrode 6, the liquid rubber hardened material 22 is applied to vertical both sides of the periphery section of this electrolyte film 4, respectively, this liquid rubber hardened material 22 pastes the electrolyte film 4 and separator 1 and 2 simultaneously with the solidification, and the binder seal 21 is formed. Therefore, since this binder seal 21 is not what is put in the state of compression, reaction force hardly generates it.

[0032] In the separator assembly seal structure equipped with the above-mentioned composition The space sections 16 and 18 are formed with slots 15 and 17 so that it may be mutually open for free passage to the separator 1 and 2 of the couple which puts the reaction polar zone 3. Since the separator 1 and 2 of a couple is unified in the state where it piled up mutually, by carrying out the injection molding of the forming material 19 which becomes these space sections 16 and 18 and slots 15 and 17 from rubber, liquid rubber, or thermoplastic elastomer It can be dealt with to one by making into a cell assembly (cell Assy) the separator 1 and 2 of this couple that put the reaction polar zone 3. Therefore, the assembly nature of a fuel cell stack can be raised. In addition, it is as the first example of the above having described that there may be no need of forming slots 15 and 17.

[0033] Moreover, in the assembly seal structure of the above-mentioned composition, since the separator 1 and 2 of a couple is unified in the state where it piled up mutually, the separator 1 and 2 of this couple is made into constant \*\*\*\*\* structure. Therefore, the size of the thickness direction of the reaction electrode section 3 can be stabilized.

[0034] Moreover, since the forming material 19 by which pouring fabrication is carried out is really fabricated by the space sections 16 and 18 and the slots 15 and 17 of separator 1 and 2 with the separator seal 14 and a material of the same kind, fabrication can be finished at once. Therefore, a forming cycle can be simplified.

[0035] Furthermore, since the separator 1 of a couple and the seal arranged among two are formed again with the binder seal 21 which carried out solidification adhesion of the compression type not a gasket but liquid rubber hardened material, generating or an operation of reaction force can be lost. Therefore, conclusion of the separator 1

and 2 by the above-mentioned forming material 19 can be stabilized.

[0036]

[Effect of the Invention] this invention does the following effects so.

[0037] Namely, it sets first in the separator assembly seal structure by the claim 1 of this invention equipped with the above-mentioned composition. The space section is prepared so that it may be mutually open for free passage to two or more separator which puts the reaction electrode section. Since two or more separator is unified in the state where it piled up mutually, by carrying out pouring fabrication of the forming material which becomes this space section from rubber, liquid rubber, or thermoplastic elastomer It can be dealt with to one by using as assembly finishing parts two or more of these separator that put the reaction electrode section. Therefore, the assembly nature of a fuel cell stack can be raised.

[0038] Moreover, since two or more separator is unified in the state where it piled up mutually, two or more of these separator is made into constant \*\*\*\*\* structure. Therefore, the size of the thickness direction of the reaction electrode section can be stabilized.

[0039] In the separator assembly seal structure by the claim 2 of this invention which was equipped with the above-mentioned composition again in addition to this, since the forming material by which pouring fabrication is carried out is a separator seal and really fabricated by the space section of separator, fabrication can be finished at once. Therefore, a forming cycle can be simplified.

[0040] Moreover, in the separator assembly seal structure by the claim 3 of this invention equipped with the above-mentioned composition, since the seal of between two or more separator unified mutually is carried out by the gasket arranged at the periphery of the reaction electrode section, the gasket combined with both separator can be shared. Therefore, the number of installation of a gasket can be reduced conventionally.

[0041] Furthermore, since the seal arranged among two or more separator is formed again in the separator assembly seal structure by the claim 4 of this invention equipped with the above-mentioned composition with the binder seal which carried out solidification adhesion of the compression type not a gasket but liquid rubber hardened material, generating or an operation of reaction force can be lost. Therefore, conclusion of the separator by the above-mentioned forming material can be stabilized.

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[Translation done.]

[JAPANESE] [JP,2001-338673,A]

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS  
CORRECTION or AMENDMENT

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**PRIOR ART**

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[Description of the Prior Art] Since the separator 53 of a couple is not attached mutually but is conventionally used as another parts, respectively while a gasket 54 is separately arranged, respectively between the electrolyte film 52 in the reaction polar zone 51, and the separator 53 of the couple which puts this as shown in drawing 7, the assembly of a fuel cell stack has taken the great man day. Moreover, since the reaction polar zone 51 does not serve as constant \*\*\*\*\*\*, there is un-arranging [ which it is referred to as that the size is not stabilized ], and a size may change with seal reaction force.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] this invention does the following effects so.

[0037] That is, it sets first in the separator assembly seal structure by the claim 1 of this invention equipped with the above-mentioned composition. The space section is prepared so that it may be mutually open for free passage to two or more separator which puts the reaction polar zone, and since two or more separator is unified in the state where it piled up mutually, by carrying out the injection molding of the forming material which becomes this space section from rubber, liquid rubber, or thermoplastic elastomer, it can be dealt with to one by using as assembly finishing parts two or more of these separator that put the reaction polar zone. Therefore, the assembly nature of a fuel cell stack can be raised.

[0038] Moreover, since two or more separator is unified in the state where it piled up mutually, two or more of these separator is made into constant \*\*\*\*\* structure. Therefore, the size of the thickness direction of the reaction polar zone can be stabilized.

[0039] In the separator assembly seal structure by the claim 2 of this invention which was equipped with the above-mentioned composition again in addition to this, since the forming material by which the injection molding is carried out to the space section of separator is a separator seal and really fabricated, fabrication can be finished at once. Therefore, a forming cycle can be simplified.

[0040] Moreover, in the separator assembly seal structure by the claim 3 of this invention equipped with the above-mentioned composition, since the seal of between two or more separator unified mutually is carried out by the gasket arranged at the periphery of the reaction polar zone, the gasket combined with both separator can be shared. Therefore, the number of installation of a gasket can be reduced conventionally.

[0041] Furthermore, since the seal arranged among two or more separator is formed again in the separator assembly seal structure by the claim 4 of this invention equipped with the above-mentioned composition with the binder seal which carried out solidification adhesion of the compression type not a gasket but liquid rubber hardened material, generating or an operation of reaction force can be lost. Therefore, conclusion of the separator by the above-mentioned forming material can be stabilized.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] this invention aims at offering the fuel cell separator assembly seal structure which can raise the dimensional stability of the reaction electrode section while it raises the assembly nature of a fuel cell stack in view of the above point.

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**MEANS**

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[Means for Solving the Problem] By carrying out the injection molding of the forming material which becomes the aforementioned space section from rubber, liquid rubber, or thermoplastic elastomer, the fuel cell separator assembly seal structure according to the claim 1 of this invention in order to attain the above-mentioned purpose prepares the space section so that it may be mutually open for free passage to two or more separator which puts the reaction polar zone, and it unifies, where two or more aforementioned separator is piled up mutually, and it is characterized by the bird clapper.

[0005] Moreover, fuel cell separator assembly seal structure of the claim 2 of this invention is characterized by the separator seal prepared in the superficies of at least one separator, and really fabricating the forming material by which the injection molding was carried out to the space section of two or more separator in the above-mentioned fuel cell separator assembly seal structure of a claim 1.

[0006] Moreover, fuel cell separator assembly seal structure by the claim 3 of this invention is characterized by arranging the gasket put between the periphery of the reaction polar zone among two or more separator in the above-mentioned fuel cell separator assembly seal structure of claims 1 or 2.

[0007] Furthermore, fuel cell separator assembly seal structure by the claim 4 of this invention is characterized by applying a liquid rubber hardened material to the periphery section of the electrolyte film in the reaction polar zone, and making the aforementioned liquid rubber hardened material paste up to the aforementioned electrolyte film and separator again in the above-mentioned fuel cell separator assembly seal structure of claims 1 or 2.

[0008] In the separator assembly seal structure of this invention equipped with the above-mentioned composition The space section is prepared so that it may be mutually open for free passage to two or more separator which puts the reaction polar zone. Since two or more separator is unified in the state where it piled up mutually, by carrying out the injection molding of the forming material which becomes this space section from rubber, liquid rubber, or thermoplastic elastomer It becomes possible to deal with it to one by using as assembly finishing parts two or more of these separator that put the reaction polar zone (claim 1).

[0009] Moreover, since two or more separator is unified in the state where it piled up mutually, two or more of these separator is made into constant \*\*\*\*\* structure. Therefore, it becomes possible to stabilize the size of the thickness direction of the reaction polar zone (claim 1).

[0010] The forming material by which the injection molding is carried out to the space section of two or more separator becomes it is suitable to really fabricate with the separator seal prepared in the superficies of at least one separator and a material of the same kind, and possible [ simplifying a forming cycle by really fabricating forming material and a separator seal in this way ] (claim 2).

[0011] Moreover, it becomes it is suitable to carry out a seal with the gasket arranged at the periphery of the reaction polar zone, and possible [ reducing the number of installation of a gasket conventionally by carrying out the seal of between separator with the gasket arranged at the periphery side of the reaction polar zone in this way ] between two or more separator unified mutually (claim 3).

[0012] moreover, making a seal execute by proxy with the liquid rubber hardened material applied to the periphery section of the electrolyte film in the reaction polar zone, when anxious about an operation of the

reaction force by this gasket -- it becomes it is suitable and possible to lose generating or an operation of reaction force by using a liquid rubber hardened material as a binder seal in this way (claim 4)

[0013]

[Embodiments of the Invention] The example of this invention is explained according to a drawing below.

[0014] The first example ... Drawing 1 shows the important section cross section of the fuel cell separator assembly seal structure concerning the first example of this invention, and the state before the assembly is shown in drawing 2. This separator assembly seal structure constitutes the cell for fuel cells as a package, and is constituted as follows.

[0015] That is, the separator 1 and 2 of the vertical couple piled up mutually first is formed, and the reaction polar zone (it is also called the MEA section) 3 is put between the separator 1 and 2 of this couple. The reaction polar zone 3 lays a positive electrode 5 and a negative electrode 6 on top of the vertical both sides of the electrolyte film 4. The gasket 7 made from rubber-like elasticity material is arranged at the periphery side of the reaction polar zone 3, between the separator 1 and 2 of a couple, predetermined compresses and this gasket 7 is put with \*\*. Drawing, expansion formation of the periphery section of the electrolyte film 4 is carried out in the direction of a flat surface rather than the periphery section of a positive electrode 5 and a negative electrode 6, the gasket 7 made from rubber-like elasticity material is arranged at the vertical both sides of the periphery section of this electrolyte film 4 by which expansion formation was carried out, and required-number formation of the bore 8 for keeping putting the positioning section 9 which carries out a postscript to the laminated structure which consists of this electrolyte film 4 and gasket 7 is carried out. The up-and-down gasket 7 may really be mutually fabricated through a bore 8.

[0016] The separator 1 and 2 of a couple is inserted in mutually and made into structure, and when required-number \*\*\*\*\*\*, this crevice 10, and heights 11 are mutually engaged by the positioning section 9 which becomes both this separator 1 and 2 from the combination of a crevice 10 and heights 11, both the separator 1 and 2 is positioned mutually. Along with the periphery section of separator 1 and 2, as for the positioning section 9, a large number are prepared in the single tier. Moreover, the crevice 12 for holding the reaction polar zone 3 and gasket 7 other than a crevice 10 is established in the inside of the lower separator 2.

[0017] It is located above the positioning section 9, the separator seal 14 is formed in the superficies of the upper separator 1, and this separator seal 14 is formed in endless along with the periphery section of separator 1. Moreover, this separator seal 14 is formed along the slot 15 similarly established in endless along with the periphery section of separator 1, and required-number opening formation of the through-hole-like space section (it is also called a through hole) 16 is carried out on the base of this slot 15. Corresponding to each positioning section 9, as for the space section 16, one is prepared at a time in the center of a flat surface. Moreover, corresponding to the slot 15 established in the superficies of the separator 1 of this top, the slot 17 is formed also like the superficies of the lower separator 2, and required-number opening formation of the through-hole-like space section (it is also called a through hole) 18 is carried out also on the base of this slot 17. As for the space section 18, corresponding to each positioning section 9, one is prepared at a time in the center of a flat surface also for this.

[0018] Correspondence formation of the upper space section 16 and the lower space section 18 is carried out mutually, it is mutually open for free passage, and the injection molding of the forming material 19 is carried out to both these space sections 16 and 18 and both the slots 15 and 17. The forming material 19 is its upper separator seal 14 and really fabricated, and simultaneous fabrication of this forming material 19 and the separator seal 14 is carried out by compression molding or injection molding by making rubber-like elasticity material, such as rubber, liquid rubber, or thermoplastic elastomer, into a molding material. Moreover, by carrying out the injection molding of this forming material 19 to the space sections 16 and 18, the separator 1 and 2 of a couple is the form where the base of the above-mentioned crevice 10 and the apical surface of heights 11 are made to associate in the thickness direction of separator 1 and 2, and is unified in the state where it piled up.

[0019] In the separator assembly seal structure equipped with the above-mentioned composition The space sections 16 and 18 are formed with slots 15 and 17 so that it may be mutually open for free passage to the

separator 1 and 2 of the couple which puts the reaction polar zone 3. Since the separator 1 and 2 of a couple is unified in the state where it piled up mutually, by carrying out the injection molding of the forming material 19 which becomes these space sections 16 and 18 and slots 15 and 17 from rubber, liquid rubber, or thermoplastic elastomer It can be dealt with to one by making into a cell assembly (cell Assy) the separator 1 and 2 of this couple that put the reaction polar zone 3. Therefore, the assembly nature of a fuel cell stack can be raised. In addition, since slots 15 and 17 escape from separator 1 and 2, stop the space section 16 and the forming material 19 in 18, and carry out them by the forming material 19 with which it fills up here and they are [ if the opening cross section of the through-hole-like space sections 16 and 18 is set up at the penetration direction edge more greatly than a center section, stop escaping ] effective, they are unnecessary in this case. [ of slots 15 and 17 ] Therefore, slots 15 and 17 may not have the need of preparing this.

[0020] Moreover, in the assembly seal structure of the above-mentioned composition, since the separator 1 and 2 of a couple is unified in the state where it piled up mutually, the separator 1 and 2 of this couple is made into constant \*\*\*\*\* structure. Therefore, the size of the thickness direction of the reaction polar zone 3 can be stabilized.

[0021] Moreover, since the forming material 19 by which the injection molding is carried out is really fabricated by the space sections 16 and 18 and the slots 15 and 17 of separator 1 and 2 with the separator seal 14 and a material of the same kind, fabrication can be finished at once. Therefore, a forming cycle can be simplified.

[0022] Furthermore, since the seal of between the separator 1 and 2 of the couple unified mutually again is carried out by the gasket 7 arranged at the periphery side of the reaction polar zone 3, the gasket 7 combined with both the separator 1 and 2 can be shared. Therefore, the number of installation of a gasket 7 is reducible conventionally (although the gasket 7 is made into vertical dual structure in the above-mentioned example in order to heighten the seal force, single structure is sufficient and, in the case of this single structure, the only gasket is shared by both the separator 1 and 2.). Therefore, the number of installation of a gasket can be reduced as compared with separator 1 and the conventional technology which needed the gasket for every two.

[0023] In addition, it is necessary to set up the conclusion force by the forming material 19 greatly rather than the reaction force of the gasket 7 put in between, and in the assembly seal structure of the above-mentioned composition, in order to maintain unification of separator 1 and 2, as shown in drawing 3, unless it sets the pitch p of the space sections 16 and 18 for conclusion below to 10mm interval and the rubber degree of hardness of forming material is raised, generally, it becomes conclusion lack of ability. Therefore, in such a case, as shown in drawing 4, in order to reinforce the conclusion force, the design disposal of adding an eyelet 20 is needed.

[0024] Moreover, the following examples are suitable, in order to lose generating or its operation of the reaction force of a gasket or to reduce the size.

[0025] The second example ... Drawing 5 shows the important section cross section of the fuel cell separator assembly seal structure concerning the second example of this invention, and the state before the assembly is shown in drawing 6. This separator assembly seal structure constitutes the cell for fuel cells as a package, and is constituted as follows.

[0026] That is, the separator 1 and 2 of the vertical couple piled up mutually first is formed, and the reaction polar zone (it is also called the MEA section) 3 is put between the separator 1 and 2 of this couple. The reaction polar zone 3 lays a positive electrode 5 and a negative electrode 6 on top of the vertical both sides of the electrolyte film 4. The binder seal 21 which is from the liquid rubber hardened material 22 on the periphery side of the reaction polar zone 3 is arranged, and this binder seal 21 is made to paste up to the electrolyte film 4 and separator 1 and 2. Drawing, expansion formation of the periphery section of the electrolyte film 4 is carried out in the direction of a flat surface rather than the periphery section of a positive electrode 5 and a negative electrode 6, and the binder seal 21 which becomes the vertical both sides of the periphery section of this electrolyte film 4 by which expansion formation was carried out from the liquid rubber hardened material 22 is arranged. Required-number formation of the bore 8 for keeping putting the positioning section 9 which carries out a postscript in the electrolyte film 4 is carried out. About the binder seal 21, it mentions later.

[0027] The separator 1 and 2 of a couple is inserted in mutually and made into structure, and when required-

number \*\*\*\*\*\*, this crevice 10, and heights 11 are mutually engaged by the positioning section 9 which becomes both this separator 1 and 2 from the combination of a crevice 10 and heights 11, both the separator 1 and 2 is positioned mutually. Along with the periphery section of separator 1 and 2, as for the positioning section 9, a large number are prepared in the single tier. Moreover, the crevice 12 for holding the reaction polar zone 2 and both the binder seal 21 other than a crevice 10 is established in the inside of the lower separator 2.

[0028] It is located above the positioning section 9, the separator seal 14 is formed in the superficies of the upper separator 1, and this separator seal 14 is formed in endless along with the periphery section of separator 1. Moreover, this separator seal 14 is formed along the slot 15 similarly established in endless along with the periphery section of separator 1, and required-number opening formation of the through-hole-like space section (it is also called a through hole) 16 is carried out on the base of this slot 15. Corresponding to each positioning section 9, as for the space section 16, one is prepared at a time in the center of a flat surface. Moreover, corresponding to the slot 15 established in the superficies of the separator 1 of this top, the slot 17 is formed also like the superficies of the lower separator 2, and required-number opening formation of the through-hole-like space section (it is also called a through hole) 18 is carried out also on the base of this slot 17. As for the space section 18, corresponding to each positioning section 9, one is prepared at a time in the center of a flat surface also for this.

[0029] Correspondence formation of the upper space section 16 and the lower space section 18 is carried out mutually, it is mutually open for free passage, and the injection molding of the forming material 19 is carried out to both these space sections 16 and 18 and both the slots 15 and 17. The forming material 19 is its upper separator seal 14 and really fabricated, and simultaneous fabrication of this forming material 19 and the separator seal 14 is carried out by compression molding or injection molding by making rubber-like elasticity material, such as rubber, liquid rubber, or thermoplastic elastomer, into a molding material. Moreover, by carrying out the injection molding of this forming material 19 to the space sections 16 and 18, the separator 1 and 2 of a couple is the form where the base of the above-mentioned crevice 10 and the apical surface of heights 11 are made to associate in the thickness direction of separator 1 and 2, and is unified in the state where it piled up.

[0030] The binder seal 21 is as follows.

[0031] That is, expansion formation of the periphery section of the electrolyte film 4 in the reaction electrode section 3 is carried out a little in the direction of a flat surface rather than the periphery section of the positive electrode 5 of the upper and lower sides, and a negative electrode 6, the liquid rubber hardened material 22 is applied to vertical both sides of the periphery section of this electrolyte film 4, respectively, this liquid rubber hardened material 22 pastes the electrolyte film 4 and separator 1 and 2 simultaneously with the solidification, and the binder seal 21 is formed. Therefore, since this binder seal 21 is not what is put in the state of compression, reaction force hardly generates it.

[0032] In the separator assembly seal structure equipped with the above-mentioned composition The space sections 16 and 18 are formed with slots 15 and 17 so that it may be mutually open for free passage to the separator 1 and 2 of the couple which puts the reaction electrode section 3. Since the separator 1 and 2 of a couple is unified in the state where it piled up mutually, by carrying out pouring fabrication of the forming material 19 which becomes these space sections 16 and 18 and slots 15 and 17 from rubber, liquid rubber, or thermoplastic elastomer It can be dealt with to one by making into a cell assembly (cell Assy) the separator 1 and 2 of this couple that put the reaction electrode section 3. Therefore, the assembly nature of a fuel cell stack can be raised. In addition, it is as the first example of the above having described that there may be no need of forming slots 15 and 17.

[0033] Moreover, in the assembly seal structure of the above-mentioned composition, since the separator 1 and 2 of a couple is unified in the state where it piled up mutually, the separator 1 and 2 of this couple is made into constant \*\*\*\*\* structure. Therefore, the size of the thickness direction of the reaction electrode section 3 can be stabilized.

[0034] Moreover, since the forming material 19 by which pouring fabrication is carried out is really fabricated

by the space sections 16 and 18 and the slots 15 and 17 of separator 1 and 2 with the separator seal 14 and a material of the same kind, fabrication can be finished at once. Therefore, a forming cycle can be simplified.

[0035] Furthermore, since the separator 1 of a couple and the seal arranged among two are formed again with the binder seal 21 which carried out solidification adhesion of the compression type not a gasket but liquid rubber hardened material, generating or an operation of reaction force can be lost. Therefore, conclusion of the separator 1 and 2 by the above-mentioned forming material 19 can be stabilized.

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[Translation done.]

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] The important section cross section of the fuel cell separator assembly seal structure concerning the first example of this invention

[Drawing 2] The important section cross section showing the state before the assembly of this separator assembly seal structure

[Drawing 3] The plane-cross-section view of separator

[Drawing 4] The cross section showing the example which added the eyelet

[Drawing 5] The important section cross section of the fuel cell separator assembly seal structure concerning the second example of this invention

[Drawing 6] The important section cross section showing the state before the assembly of this separator assembly seal structure

[Drawing 7] Explanatory drawing concerning the conventional example

[Description of Notations]

1 Two Separator

3 Reaction Polar Zone

4 Electrolyte Film

5 Positive Electrode

6 Negative Electrode

7 Gasket

8 Bore

9 Positioning Section

10 12 Crevice

11 Heights

14 Separator Seal

15 17 Slot

16 18 Space section

19 Forming Material

20 Eyelet

21 Binder Seal

22 Liquid Rubber Hardened Material

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**CORRECTION or AMENDMENT**

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[Official Gazette Type] Printing of amendment by the convention of 2 of Article 17 of patent law.

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[\*\*\*\* format] Open patent official report 13-3387.

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H01M        8/24  
F16J        15/10

**[FI]**

H01M        8/24              T  
F16J        15/10              Y

[Procedure revision]

[Filing Date] October 22, Heisei 13 (2001. 10.22)

[Procedure amendment 1]

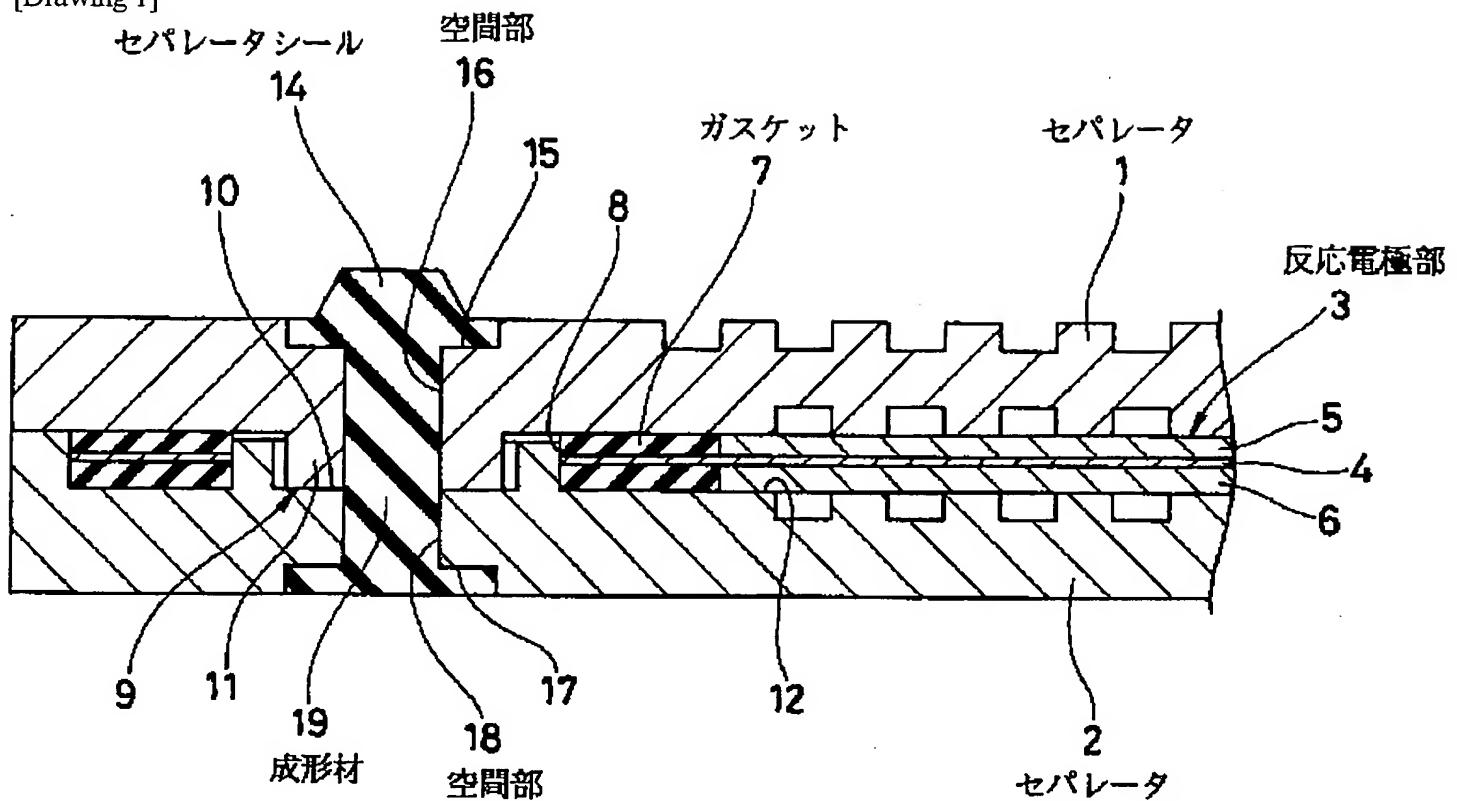
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[Item(s) to be Amended] Complete diagram.

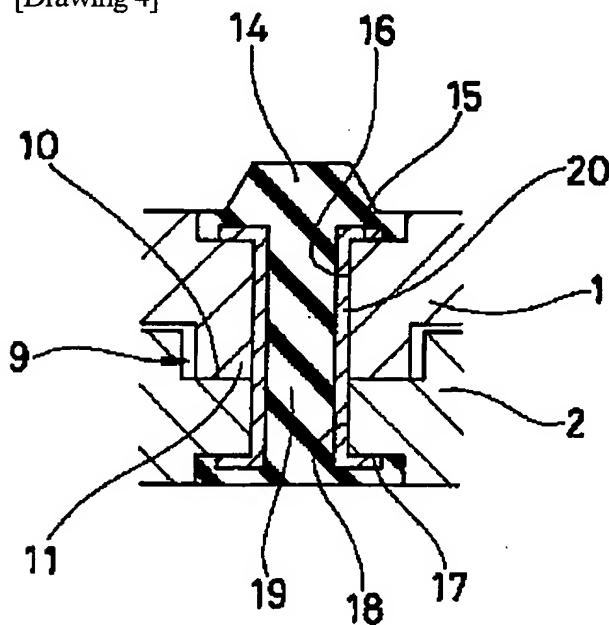
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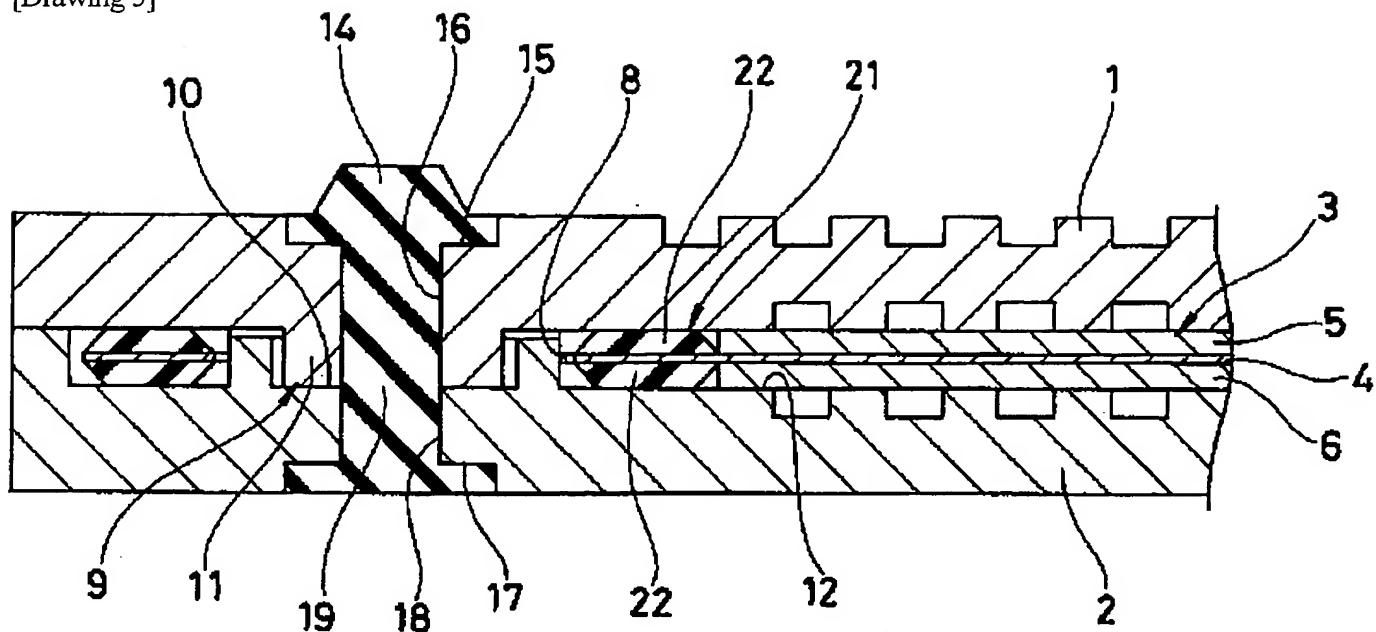
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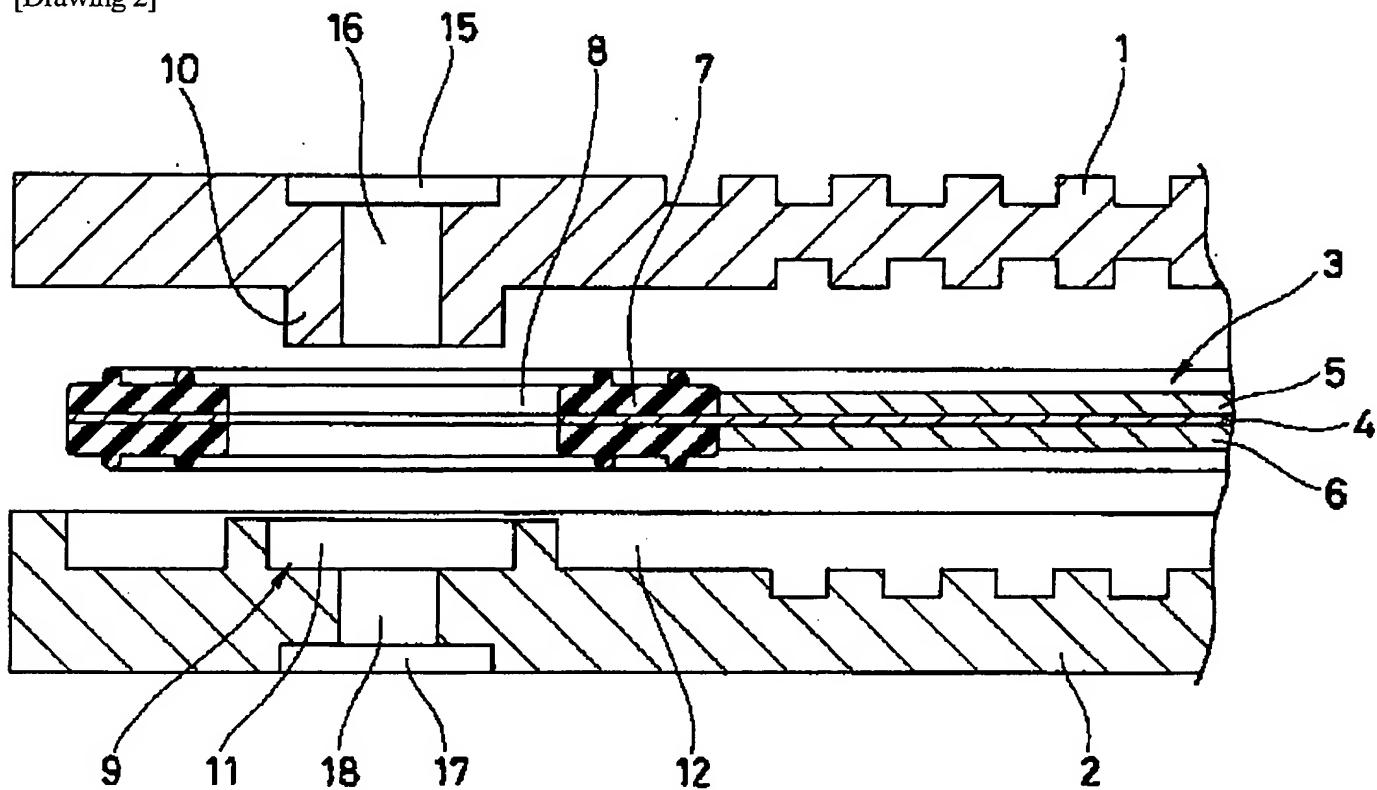
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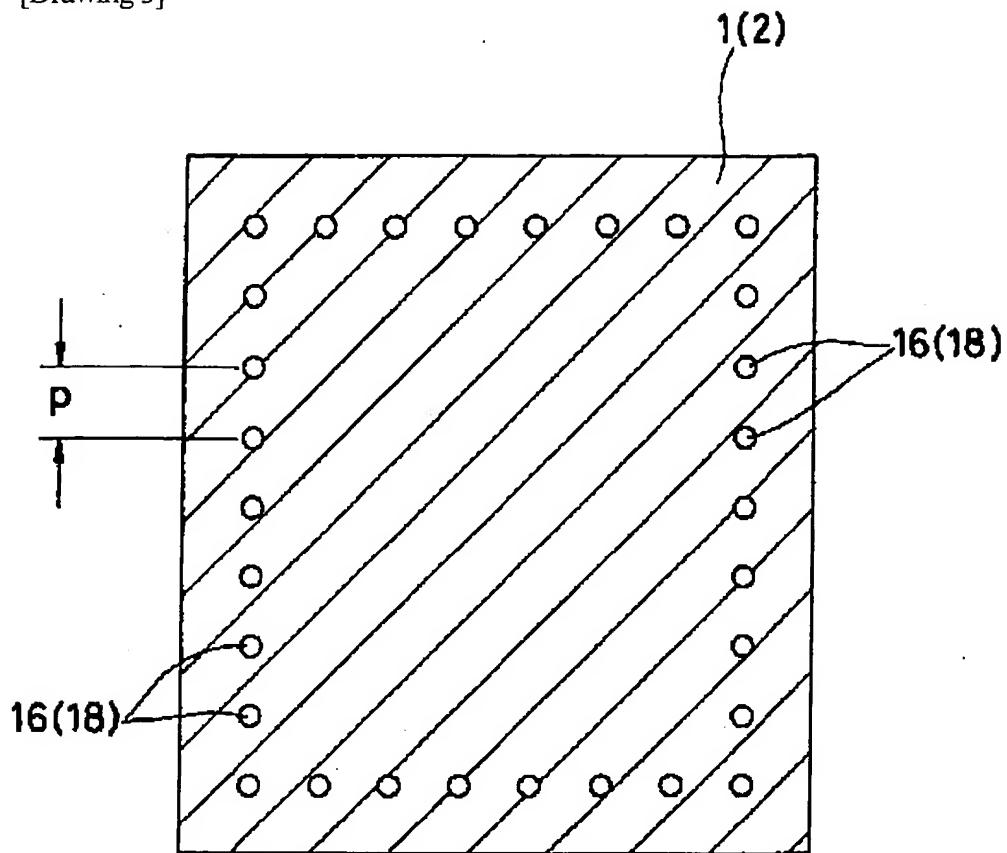
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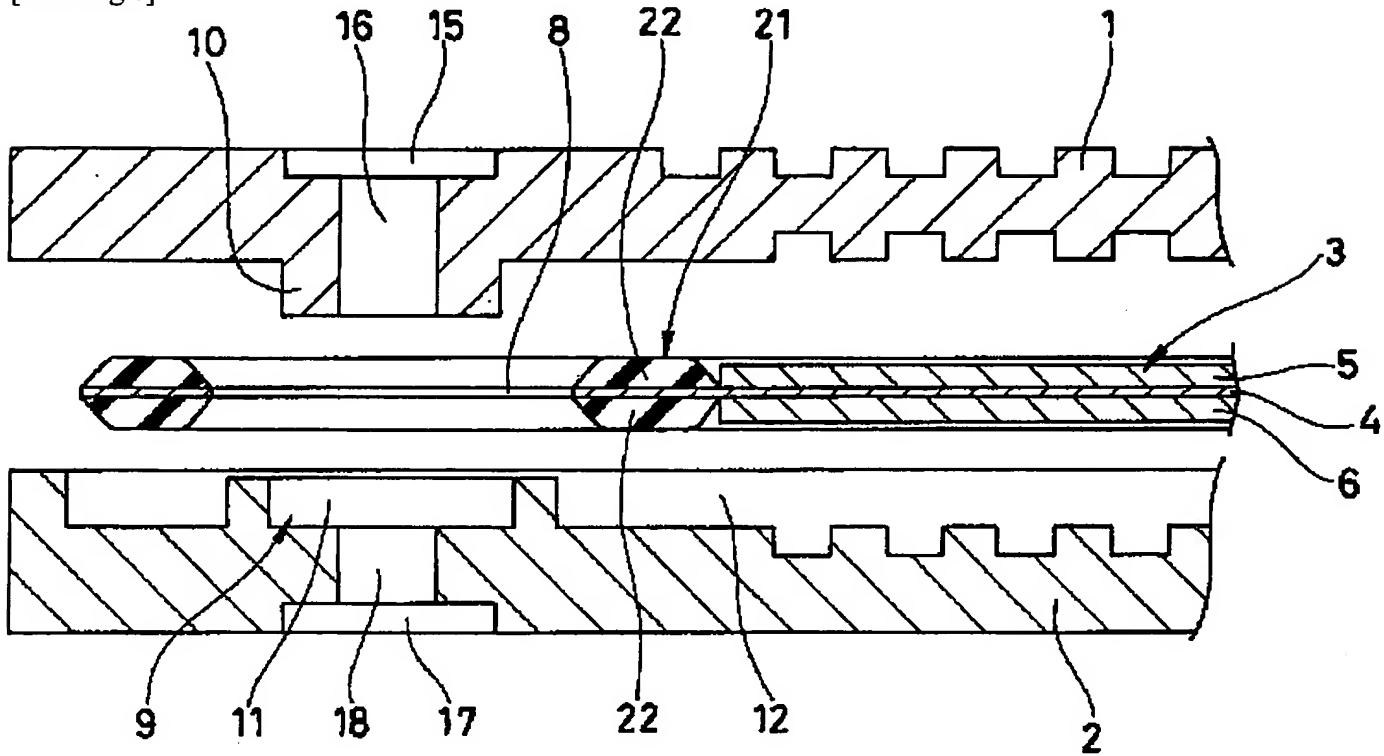
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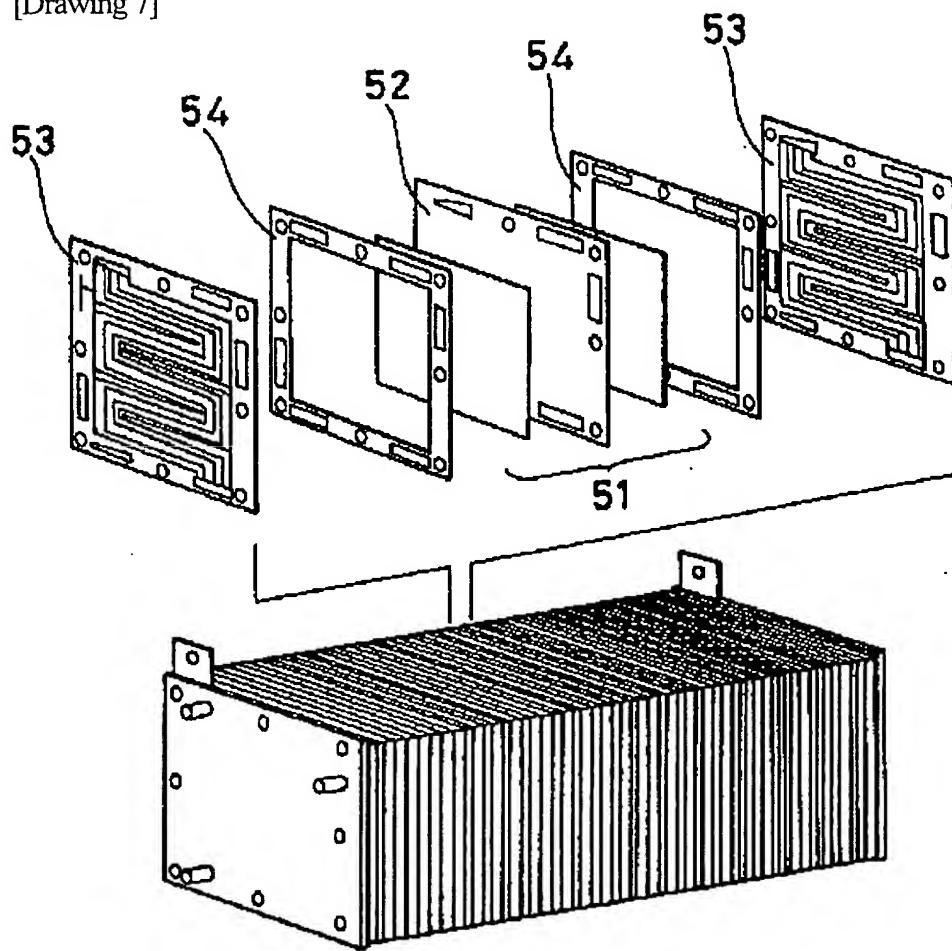
[Drawing 3]



[Drawing 6]



[Drawing 7]



[Translation done.]